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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/737,123
Filing Date: December 16, 2003
Appellant(s): FAN ET AL.

Duane N. Moore
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 06/09/2008 appealing from the Office action mailed 01/12/2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

20030212679	VEBKALAYA	11-2003
6,513,025	ROSEN	1-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Venkayala et al. (US Pub. No 20030212679), in view of Rosen et al. (US Patent No. 6,513,025).

As to claims 1, 28,Venkayala teaches a method/program storage device/system of searching data in databases using an ensemble of models (i.e. seeds models, [0018]), said method program storage device/system comprising:

ordering models within said ensemble in order of prediction accuracy (i.e. Trained model 110 may also be evaluated and adjusted in order to improve the quality, i.e. prediction accuracy, of the model, [0019]), with the most accurate model being first in said order (i.e. a topmost category including a class value having a highest associated probability, [0010]), ([0008-0009, 0018, 0019, 0035]);

selecting a sub-ensemble of said models that meets a given level of confidence (i.e. how much confidence may be placed in the prediction, [0023], the selected class values are those meeting the selection criteria presented in prediction parameters, [0024]), wherein said sub-ensemble in said order prediction accuracy ([0010, 0035]), *(i.e. the selection criteria may include a limit on the number of class values that are to be selected, or may indicate that the class values*

are to be sorted based on their associated probabilities. The selected class values, which are included in multi-category apply output 122, are output from step 120, [0024]); and

applying said sub-ensemble, in place of said ensemble, to an example to make a prediction (i.e. The selected class values, which are included in multi-category apply output, [0024]) ([0010, 0035]), *(i.e. generate one or more scores for each row of data in scoring data 116. The scores for each row of data indicate how closely the row of data matches attributes of the model, how much confidence may be placed in the prediction, how likely each output prediction/recommendation to be true, and other statistical indicators. Scored data 118 is output from scoring step 112 and includes predictions or recommendations, along with corresponding probabilities for the scored data, [0023]).*

Venkayala teaches the step of forming sub-ensembles, wherein said sub-ensembles in said order of prediction accuracy (i.e. model apply, [0017]).

Venkayala does not expressly teach "models are joined together in said sub-ensemble". However, Rosen teaches "models are joined together in said sub-ensemble" (i.e. The most dependable classification model, that is the classification model associated with the dependability model indicating the highest dependability for the unlabeled example, is chosen to classify each unclassified example (col. 4, line 66 to col. 5, line 9).

It would have been obvious to one of ordinary skill of the art having the teaching of Venkayala and Rosen at the time the invention was made to modify the system of Venkayala to include wherein models are joined together in said sub-ensemble in said order of prediction accuracy as taught by Rosen. One of ordinary skill in the art would be motivated to make this combination in order to select the most appropriate classification model, and the prediction of

that classification model is then accepted in view of Rosen, as doing so would give the added benefit of coalescing the predictions of the base models by learning the relationships between those predictions and the correct prediction, identifying a specific classification model as the one responsible for producing a final prediction and to including a simple explanation of why the prediction was made, and revising the selected model as the models change over time as taught by Rosen (col. 2, lines 31-42).

As per claim 8, Venkayala teaches a method of searching data in databases using an ensemble of models (i.e. seeds models, [0018]), said method comprising:

ordering models within said ensemble in order of prediction accuracy (i.e. Trained model 110 may also be evaluated and adjusted in order to improve the quality, i.e. prediction accuracy of the model, [0019]), with the most accurate model being first in said order (i.e. a topmost category including a class value having a highest associated probability, [0010]) ([0008-0009, 0018, 0019, 0035]);

selecting a sub-ensemble of said models that meets a given level of confidence (i.e. how much confidence may be placed in the prediction, [0023], the selected class values are those meeting the selection criteria presented in prediction parameters, [0024]), wherein said sub-ensemble in said order prediction accuracy, such that said sub-ensemble include only the most accurate models (i.e. a topmost category including a class value having a highest associated probability, [0010]) ([0008, 0009, 0035]), *(i.e. the selection criteria may include a limit on the number of class values that are to be selected, or may indicate that the class values are to be*

sorted based on their associated probabilities. The selected class values, which are included in multi-category apply output 122, are output from step 120, [0024]); and

applying said sub-ensemble, in place of said ensemble, to an example to make a prediction (i.e. The selected class values, which are included in multi-category apply output, [0024]) ([0010, 0035]), *(i.e. generate one or more scores for each row of data in scoring data 116. The scores for each row of data indicate how closely the row of data matches attributes of the model, how much confidence may be placed in the prediction, how likely each output prediction/recommendation to be true, and other statistical indicators. Scored data 118 is output from scoring step 112 and includes predictions or recommendations, along with corresponding probabilities for the scored data, [0023]).*

Venkayala teaches the step of forming sub-ensembles, wherein said sub-ensembles in said order of prediction accuracy (i.e. model apply, [0017]).

Venkayala does not expressly teach "models are joined together in said sub-ensemble".

However, Rosen teaches "models are joined together in said sub-ensemble" (i.e. The most dependable classification model, that is the classification model associated with the dependability model indicating the highest dependability for the unlabeled example, is chosen to classify each unclassified example (col. 4, line 66 to col. 5, line 9).

It would have been obvious to one of ordinary skill of the art having the teaching of Venkayala and Rosen at the time the invention was made to modify the system of Venkayala to include wherein models are joined together in said sub-ensemble in said order of prediction accuracy as taught by Rosen. One of ordinary skill in the art would be motivated to make this combination in order to select the most appropriate classification model, and the prediction of

that classification model is then accepted in view of Rosen, as doing so would give the added benefit of coalescing the predictions of the base models by learning the relationships between those predictions and the correct prediction, identifying a specific classification model as the one responsible for producing a final prediction and to including a simple explanation of why the prediction was made, and revising the selected model as the models change over time as taught by Rosen (col. 2, lines 31-42).

As per claim 15, Venkayala teaches a method of searching data in databases using an ensemble of models (i.e. seeds models, [0018]), said method comprising:

performing training (i.e. training/model building, [0017, 0019]) comprising:

ordering models within said ensemble in order of prediction accuracy (i.e. Trained model 110 may also be evaluated and adjusted in order to improve the quality, i.e. prediction accuracy, of the model, [0019]), with the most accurate model being first in said order (i.e. a topmost category including a class value having a highest associated probability, [0010]) ([0008-0009, 0018, 0019, 0035]);

forming sub-ensembles (i.e. model apply, [0017]), wherein said sub-ensemble in said order of prediction accuracy ([0010, 0035]);

calculating confidence values of each of said sub-ensembles (i.e. to generate one or more scores for each row of data in scoring data. The scores for each row of data indicate how closely the row of data matches attributes of the model, how much confidence may be placed in the prediction, [0023]); and making a prediction comprising:

selecting a sub-ensemble of said models that meets a given level of confidence (i.e. The selected class values are those meeting the selection criteria presented in prediction parameters, [0024]) ([0010, 0035]), *(i.e. the selection criteria may include a limit on the number of class values that are to be selected, or may indicate that the class values are to be sorted based on their associated probabilities. The selected class values, which are included in multi-category apply output 122, are output from step 120, [0024])*; and

applying said sub-ensemble, in place of said ensemble, to an example to make a prediction (i.e. The selected class values, which are included in multi-category apply output, [0024]) ([0010, 0035]), *(i.e. generate one or more scores for each row of data in scoring data 116. The scores for each row of data indicate how closely the row of data matches attributes of the model, how much confidence may be placed in the prediction, how likely each output prediction/recommendation to be true, and other statistical indicators. Scored data 118 is output from scoring step 112 and includes predictions or recommendations, along with corresponding probabilities for the scored data, [0023]).*

Venkayala teaches the step of forming sub-ensembles, wherein said sub-ensembles in said order of prediction accuracy (i.e. model apply, [0017]).

Venkayala does not expressly teach "joining different number of models together to form sub-ensembles".

However, Rosen teaches "joining different number of models together to form sub-ensembles" (i.e. The most dependable classification model, that is the classification model associated with the dependability model indicating the highest dependability for the unlabeled example, is chosen to classify each unclassified example (col. 4, line 66 to col. 5, line 9).

It would have been obvious to one of ordinary skill of the art having the teaching of Venkayala and Rosen at the time the invention was made to modify the system of Venkayala to include joining different numbers of models together to form sub-ensembles, wherein models are joined together in said sub-ensemble in said order of prediction accuracy as taught by Rosen. One of ordinary skill in the art would be motivated to make this combination in order to select the most appropriate classification model, and the prediction of that classification model is then accepted in view of Rosen, as doing so would give the added benefit of coalescing the predictions of the base models by learning the relationships between those predictions and the correct prediction, identifying a specific classification model as the one responsible for producing a final prediction and to including a simple explanation of why the prediction was made, and revising the selected model as the models change over time as taught by Rosen (col. 2, lines 31-42).

As per claim 21, Venkayala teaches a service of searching data in databases using an ensemble of models (i.e. seeds models, [0018]), said service comprising:

ordering models within said ensemble in order of prediction accuracy (i.e. Trained model 110 may also be evaluated and adjusted in order to improve the quality, i.e. prediction accuracy, of the model, [0019]), with the most accurate model being first in said order (i.e. a topmost category including a class value having a highest associated probability, [0010]) ([0008-0009, 0018, 0019, 0035]);

selecting a sub-ensemble of said models that meets a given level of confidence (i.e. how much confidence may be placed in the prediction, [0023], the selected class values are those

meeting the selection criteria presented in prediction parameters, [0024]), wherein said sub-ensemble in said order prediction accuracy ([0010, 0035]), *(i.e. the selection criteria may include a limit on the number of class values that are to be selected, or may indicate that the class values are to be sorted based on their associated probabilities. The selected class values, which are included in multi-category apply output 122, are output from step 120, [0024])*; and

applying said sub-ensemble, in place of said ensemble, to an example to make a prediction (i.e. The selected class values, which are included in multi-category apply output, [0024]) ([0010, 0035]), *(i.e. generate one or more scores for each row of data in scoring data 116. The scores for each row of data indicate how closely the row of data matches attributes of the model, how much confidence may be placed in the prediction, how likely each output prediction/recommendation to be true, and other statistical indicators. Scored data 118 is output from scoring step 112 and includes predictions or recommendations, along with corresponding probabilities for the scored data, [0023])*.

Venkayala teaches the step of forming sub-ensembles, wherein said sub-ensembles in said order of prediction accuracy (i.e. model apply, [0017]).

Venkayala does not expressly teach “models are joined together in said sub-ensemble”.

However, Rosen teaches “models are joined together in said sub-ensemble” (i.e. The most dependable classification model, that is the classification model associated with the dependability model indicating the highest dependability for the unlabeled example, is chosen to classify each unclassified example (col. 4, line 66 to col. 5, line 9).

It would have been obvious to one of ordinary skill of the art having the teaching of Venkayala and Rosen at the time the invention was made to modify the system of Venkayala to

include wherein models are joined together in said sub-ensemble in said order of prediction accuracy as taught by Rosen. One of ordinary skill in the art would be motivated to make this combination in order to select the most appropriate classification model, and the prediction of that classification model is then accepted in view of Rosen, as doing so would give the added benefit of coalescing the predictions of the base models by learning the relationships between those predictions and the correct prediction, identifying a specific classification model as the one responsible for producing a final prediction and to including a simple explanation of why the prediction was made, and revising the selected model as the models change over time as taught by Rosen (col. 2, lines 31-42).

As per claim 35, Venkayala teaches a system of searching data in databases using an ensemble of models (i.e. seeds models, [0018]), said system comprising:

means for ordering models within said ensemble in order of prediction accuracy (i.e. Trained model 110 may also be evaluated and adjusted in order to improve the quality, i.e. prediction accuracy, of the model, [0019]), with the most accurate model being first in said order (i.e. a topmost category including a class value having a highest associated probability, [0010]), ([0008-0009, 0018, 0019, 0035]);

means for selecting a sub-ensemble of said models that meets a given level of confidence (i.e. how much confidence may be placed in the prediction, [0023], the selected class values are those meeting the selection criteria presented in prediction parameters, [0024]), wherein said sub-ensemble in said order prediction accuracy ([0010, 0035]), *(i.e. the selection criteria may include a limit on the number of class values that are to be selected, or may indicate that the*

class values are to be sorted based on their associated probabilities. The selected class values, which are included in multi-category apply output 122, are output from step 120, [0024]); and

means for applying said sub-ensemble, in place of said ensemble, to an example to make a prediction (i.e. The selected class values, which are included in multi-category apply output, [0024]) ([0010, 0035]), *(i.e. generate one or more scores for each row of data in scoring data 116. The scores for each row of data indicate how closely the row of data matches attributes of the model, how much confidence may be placed in the prediction, how likely each output prediction/recommendation to be true, and other statistical indicators. Scored data 118 is output from scoring step 112 and includes predictions or recommendations, along with corresponding probabilities for the scored data, [0023]).*

Venkayala teaches the step of forming sub-ensembles, wherein said sub-ensembles in said order of prediction accuracy (i.e. model apply, [0017]).

Venkayala does not expressly teach "models are joined together in said sub-ensemble". However, Rosen teaches "models are joined together in said sub-ensemble" (i.e. The most dependable classification model, that is the classification model associated with the dependability model indicating the highest dependability for the unlabeled example, is chosen to classify each unclassified example (col. 4, line 66 to col. 5, line 9).

It would have been obvious to one of ordinary skill of the art having the teaching of Venkayala and Rosen at the time the invention was made to modify the system of Venkayala to include wherein models are joined together in said sub-ensemble in said order of prediction accuracy as taught by Rosen. One of ordinary skill in the art would be motivated to make this combination in order to select the most appropriate classification model, and the prediction of

that classification model is then accepted in view of Rosen, as doing so would give the added benefit of coalescing the predictions of the base models by learning the relationships between those predictions and the correct prediction, identifying a specific classification model as the one responsible for producing a final prediction and to including a simple explanation of why the prediction was made, and revising the selected model as the models change over time as taught by Rosen (col. 2, lines 31-42).

As to claims 2, 9, 16, 22, 29, Venkayala teaches said sub-ensemble includes fewer models than said ensemble (i.e. The selection criterion may comprise one of a topmost category including a class value having a highest associated probability, top N categories including N class values having highest associated probabilities, bottom N categories including N class values having lowest associated probabilities, or a set of select class values specified by the user and their associated probabilities and ranks, [0010]).

As to claims 3, 10, 17, 23, 30, Venkayala teaches said confidence is a measure of how closely results from said sub-ensemble will match results from said ensemble (i.e. The scores for each row of data indicate how closely the row of data matches attributes of the model, how much confidence may be placed in the prediction, how likely each output, [0049]).

As to claims 4, 11, 18, 24, 31, Venkayala teaches the size of each sub-ensemble is different and has a potentially different level of confidence (i.e. The selection criterion may comprise one of a topmost category including a class value having a highest associated

probability, top N categories including N class values having highest associated probabilities, bottom N categories including N class values having lowest associated probabilities, or a set of select class values specified by the user and their associated probabilities and ranks, [0010]).

As to claims 5, 12, 19, 25, 32, Venkayala teaches the size of said ensemble is fixed (i.e. the selection criteria may include a limit on the number of class values that are to be selected, [0050]), (i.e. a predetermined set of categories, [0020]).

As to claims 6, 13, 20, 26, 33, Venkayala teaches as the level of confidence is raised, a sub-ensemble that has more models will be selected in said selecting process (i.e. The selection criteria may be defined by desired results data, [0024]), and as the level of confidence is lowered, a sub-ensemble that has fewer models will be selected in said selecting process (i.e. The selection criterion may comprise one of a topmost category including a class value having a highest associated probability, top N categories including N class values having highest associated probabilities, bottom N categories including N class values having lowest associated probabilities, or a set of select class values specified by the user and their associated probabilities and ranks, [0010]).

As to claims 7, 14, 27, 34, Venkayala teaches before said selecting, calculating confidence values of different sub-ensembles (i.e. to generate one or more scores for each row of data in scoring data. The scores for each row of data indicate how closely the row of data matches attributes of the model, how much confidence may be placed in the prediction, [0049]).

(10) Response to Argument

1. Overview of the claimed invention and reference Venkayala

In summary, the instant application relates to a classifier ensemble method in the machine-learning and data-mining environment where the use of multiple models (ensembles) can scale up data mining over very large databases and datasets. Ensembles of models (classifiers) achieve the same or even better accuracy than a single model computed from the entire dataset. This invention provides an adaptive pruning the ensemble approach to reduce the "expected" number of classifiers employed in prediction by generating diverse (i.e. wide range) classifiers, and selecting the proper base classifier to join the ensemble. It measures the confidence of a prediction by a subset of classifiers in the ensemble. Thus, confidence is used to decide if more classifiers are needed in order to produce a prediction that is the same as the original ensemble with more classifiers. The areas of applications that benefit from this invention include fraud detection, risk management, trading surveillances, medical diagnosis, intrusion detection, as well as security and exchange ([0007], [0017]).

Similarly, Venkayala discloses a supervised learning is a collection of techniques in data mining that are used to build a model from a given set of records, known as a training set, whose class values are known a priori. Once the model is built, it is tested against another set of records with known class values, known as a test set, in order to quantify the quality of the model. It is then used to predict (or score) unknown class values of real-world records. This last stage where the model is used for prediction is termed apply [0003]. This technique can also be used for unsupervised models such as

clustering models. Clustering analysis identifies clusters embedded in the data where a cluster is a collection of records in the data that are similar to one another. Once clusters are identified from a given set of records, one can get predictions for new records on which cluster each record is likely to belong. Such predictions may be associated with probability, the quality of fit, which describes how well a given record fits in the predicted cluster, and the distance from the center of the predicted cluster [0005]. Analogously to the instant application, Venkayala discloses that the traditional applications of such supervised learning techniques include retail target marketing, medical diagnosis, weather prediction, credit approval, customer segmentation, and fraud detection [0003].

It is noted that as specified in the instant specification, a model is a classifier, and an ensemble of models is group of classifiers, (See [0007, 0017], Specification).

Based on the similarities of the inventions, the following terms of the instant application read on Venkayala's as:

searching data in databases using an ensemble of models equates to the step of *providing a multi-category apply operation in a data mining system that produces output with multiple class values and their associated probabilities* (Venkayala ([0006]).

an ensemble of models equates to the *group of categories* of Venkayala.

It should be noted that a category of Venkayala includes a class value, thus *a set of selected class values* of Venkayala equates to **a sub-ensemble** of Applicants.

performing training orders models within the ensemble in order of prediction accuracy, with the most accurate model being first ([0005]) equates to

"model building (supervised learning or unsupervised) and scoring of models (model apply), is shown in FIG. 1. The training/model building step 102 involves generating the models that are used to perform data mining recommendation and prediction" (Venkayala [0017]).

the sub-ensembles include fewer models than the ensemble and each sub-ensemble includes only the most accurate models of Applicants ([0005]) equates to *top N categories including N class values having highest associated probabilities, bottom N categories including N class values having lowest associated probabilities, or a set of select class values specified by the user and their associated probabilities and ranks* (Venkayala [0008]).

It should be noted that Venkayala teaches a selected class values corresponding to categories (i.e. ensemble of models); hence, the set of selected class values corresponds to a sub set categories, e.g. top N categories including N class values *(i.e. the selection criteria may include a limit on the number of class values that are to be selected, or may indicate that the class values are to be sorted based on their associated probabilities. The selected class values, which are included in multi-category apply output 122, are output from step 120, [0024])*. Therefore, a sub set categories of Venkayala equates to a sub-ensemble of Applicants.

calculating confidence values of each of the sub-ensembles equates to *how much confidence may be placed in the prediction ([0023]), the selected class values are those meeting the selection criteria presented in prediction parameters 114* ([0024]).

the models are joined together in the sub-ensemble in the order of prediction accuracy, although Venkayala does not state the term “join”, this limitation is implicitly taught by Venkayala as a set of selected class values including in multi-category ([0024]).

the confidence is a measure of how closely results from the sub-ensemble will match results from the ensemble equates to *The scores for each row of data indicate how closely the row of data matches attributes of the model, how much confidence may be placed in the prediction* ([0023]).

the size of each of the sub-ensembles is variable depending upon the level of confidence equates a set of select class values <u>specified</u> by the user and their <u>associated probabilities and ranks</u> (Venkayala [0008]).

Examiner’s Position:

a. Independent Claims 1, 8, 15, 21, 28, 35

The proposed combination of Venkayala teaches/suggests the claimed features "applying said sub ensemble, in place of said ensemble, to an example to make a prediction” as “*generating one or more scores for each row of data in scoring data 116. The scores for each row of data indicate how closely the row of data matches attributes of the model, how much confidence may be placed in the prediction, how likely each output prediction/recommendation to be true, and other statistical indicators. Scored data 118 is output from scoring step 112 and includes predictions or recommendations, along with corresponding probabilities for the scored data”, [0023].*

Appellant contends that "nothing within Venkayala discloses ensembles and sub-ensembles", however, as explained in the preceding paragraphs, ensembles are the groups of categories. In addition, since each category of Venkayala comprises a class value, a set of selected class value is thus corresponds to the claimed feature sub-ensemble.

Furthermore, contrary to Appellant's belief that only a single model is built and utilized, as shown in Fig. 1, the Examiner respectfully points out that models are built (i.e. multi- category apply output) in accordance with ***seed models*** in combination with training parameter and training data. As taught by Venkayala, *"this technique can also be used for unsupervised models such as clustering models"*, ([0005]).

Appellant concedes that "nothing within Venkayala teaches or suggests the creation of ensembles and sub-ensembles of models to make a prediction", the Examiner respectfully traverses.

It is noted that Venkayala teaches "a method for multi-category apply in a data mining system that comprises the steps of receiving input data for scoring including a plurality of **rows of data applied to a data mining model and generating multi-category apply output with a plurality of predicted class values and their associated probabilities based on the received input data and a selection criterion**" [0007]; therefore, the step of *receiving input data for scoring including a plurality of rows of data applied to a data mining model* illustrates how **rows of data** reads on **an example** of the claimed limitation.

Venkayala teaches that *receiving input data for scoring including a plurality of rows of data applied to a data mining model and generating multi-category apply output with a plurality of predicted class values and their associated probabilities based on the received input data and a selection criterion* where *generating multi-category apply output may comprise the steps of generating input data tables including active attributes and source attributes, evaluating probabilities of categories of a target attribute to determine those* ***meeting the selection criterion****, and generating an output data table including a plurality of class values of the target attribute and their associated probabilities,* ***the selected class*** *values having probabilities meeting the selection criterion,([0007]);* thus, **applying sub-ensemble** equates to the step of **the selection criterion or the selected class values.**

It is also noted that the "selection criterion" of Venkayala is a set of class values or top N categories, which can also be equated to the sub-ensemble *(i.e. top N categories including N class values having highest associated probabilities, bottom N categories including N class values having lowest associated probabilities, or a set of select class values specified by the user and their associated probabilities and ranks, See [0009], Venkayala). Further,* the step of *generating multi-category apply output with a plurality of predicted class values and their associated probabilities based on the received input data and a selection criterion, [0007])* indicates how **generating multi-category** of Venkayala reads on the claimed limitation **make a prediction,** it is the Examiner's position that contrary to Appellant's belief, the selection criterion, which is a

set of selected class values that can also be equated to the sub-ensemble, is used in place of the model to make predictions.

b. Dependent Claims 2, 9, 16, 22, 29

As detailed in the preceding paragraphs, ensembles are the groups of categories; and since each category of Venkayala comprises a selected class value, the set of selected class value is thus corresponds to the claimed feature sub-ensemble. Furthermore, contrary to Appellant's belief that only a single model is built and utilized; however, in view of Fig. 1, the Examiner respectfully points out that models are built (i.e. multi- category apply output) in accordance with seed models in combination with training parameter and training data. As taught by Venkayala, *"this technique can also be used for unsupervised models such as clustering models"*, ([0005]), and *"model building (supervised learning or unsupervised) and scoring of models (model apply), is shown in FIG. 1. The training/model building step 102 involves generating the models that are used to perform data mining recommendation and prediction",* [0017].

Thus, the proposed combination of Venkayala teaches/suggests the claimed features *"sub-ensemble includes fewer models than said ensemble"* as Venkayala teaches *top N categories including N class values having <u>highest</u> associated probabilities, bottom N categories including N class values having <u>lowest</u> associated probabilities, or <u>a set of selected class values specified by</u> the user and their associated probabilities and <u>ranks</u>*, [0008].

c. Dependent Claims 3, 10, 17, 23, 30

The proposed combination of Venkayala teaches/suggests the claimed features "wherein said confidence is a measure of how closely results from said sub-ensemble will match results from said ensemble" as *"The scores for each row of data indicate how closely the row of data matches attributes of the model, how much confidence may be placed in the prediction, how likely each output prediction/recommendation to be true, and other statistical indicators. Scored data 118 is output from scoring step 112 and includes predictions or recommendations, along with corresponding probabilities for the scored data", [0023].*

According to the instant specification, "the invention is applicable to a wide range of ensembles. It measures the confidence of a prediction by a subset of classifiers in the ensemble. Thus, confidence is used to decide if more classifiers are needed in order to produce a prediction that is the same as the original ensemble with more classifiers " [0017], and "the prediction accuracy for each model is calculated by checking predictions made with each model separately using validation data (or training data that was initially used to train the model, if insufficient validation data is unavailable), [0018]; therefore, *"row of data" corresponds to "an example", or validation data or training data to train a model, an ensemble, or a sub-ensemble (i.e. a set of select class value specified by the user and their associated probabilities and ranks) as "*rows of data applied to a data mining model and associated measures, including probabilities of predictions, ranks, quality of fit, or distance" (see claim 1, Venkayala); thus the scores for each row is a level of confidence to measure how closely results from row of data in

accordance with selected class value (sub-ensemble) will match results from models, or set of categories, multi-category (ensemble).

d. Dependent Claims 6, 13, 20, 26, 33

The proposed combination of Venkayala teaches/suggests the claimed features "wherein as the level of confidence is raised, a sub-ensemble that has more models will be selected in said selecting process, and as the level of confidence is lowered, a sub-ensemble that has fewer models will be selected in said selecting process" as *"the selection criterion may comprise one of a topmost category including a class value having a highest associated probability, top N categories including N class values having highest associated probabilities, bottom N categories including N class values having lowest associated probabilities, or a set of select class values specified by the user and their associated probabilities and ranks",* ([0010]).

Venkayala also read on the claimed limitations as *"Scored data 118 is input to multi-category apply step, which evaluates the probabilities associated with the class values and selects a plurality of class values and their associated measures, such as probabilities. The selected class values are those meeting the selection criteria presented in prediction parameters 114. The selection criteria may be defined by desired results data and/or by predefined or default criteria included in selection/generation step 120. In addition, the selection criteria may include a limit on the number of class values that are to be selected, or may indicate that the class values*

<u>are to be sorted based on their associated probabilities</u>. The selected class values, which are included in multi-category apply output 122, are output from step 120, [0024].

e. Dependent Claims 4, 5, 7, 11, 12, 14, 18, 19, 24, 25, 27

As discussed above, the proposed combination of Venkayala and Rosen render the independent claims 1, 8, 15, 21, 28 and dependent claims 4, 5, 7, 11, 12, 14, 18, 19, 24, 25, 27, 31, 32, 34 obvious.

Based on the foregoing discussion, it is submitted that all claims are not patentably distinct over the cited art of record.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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